Putting the Husband Through: The Role of Credit Constraints in the Timing of Marriage and Spousal Education

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In the United States, age at first marriage was lowest and the education gap between husbands and wives was highest during the 1950s. The conventional explanation for such a negative correlation is that early marriage leads to earlier and higher fertility, which in turn prevents women from acquiring education. Here, we propose that early marriages enabled couples to overcome credit constraints in education. A model that includes this motive and mechanism can replicate not only the marriage and education patterns observed in the middle of the century in the United States but also the overall trends over the twentieth century.

I. Introduction

In the United States, periods of early marriage were strongly correlated with women acquiring less education than their husbands during the twentieth century. The conventional explanation for this link is that early marriage

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leads to earlier and higher fertility, which in turn prevents women from acquiring education. However, this view is difficult to reconcile with the fact that the widening of the US gender gap was due not to women lowering their levels of educational attainment but rather to men increasing theirs at a faster clip than women. In addition, the mid-twentieth century marks an unusual era in the United States when age at first marriage fell while educational attainment increased quite dramatically, particularly for men. It is, in fact, quite puzzling that the marriage age fell in the United States when high school completion and college enrollment of men trended up.

There has to date been a dearth of theoretical models in economics that can help to explain these empirical facts. In what follows, we propose an answer to this puzzle: why did the marriage age fall when the education of men increased while women's did not during the middle of the twentieth century? Our basic premise is that early marriages in the middle of the twentieth century enabled couples to overcome some of the credit constraints that could have bound husbands from acquiring education. We show that a calibrated model that includes this motive and mechanism can replicate not only the marriage and education patterns observed in the middle of the century in the United States but also the overall trends over the twentieth century. We then present and discuss some further corollary predictions of the theory to illustrate how they match the patterns seen in the relevant data.

One can readily find historical references to the so-called PhT phenomenon (the acronym for "putting the husband through"), in particular for the generations marrying after the Second World War. As a relevant anecdotal reference, consider that some US universities or their student associations were awarding the PhT degree to students' wives in the 1950s as an acknowledgment of the sacrifices many of them made for their husbands to earn their degrees. In section II, we provide a variety of archival evidence that documents that this phenomenon was more than an isolated incident in our period of study.

We then put forward a number of facts that have not been detailed previously regarding marriage age and educational decisions of Americans in the twentieth century. First, we show that while the age at first marriage of all men fell during the first half of the century, this trend was more pronounced for men with higher levels of education. Second, we provide

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evidence that the wives of men in school assumed labor market roles geared toward providing more income support: they worked more, had higher incomes, and were less likely to have children than spouses of men who were not in school.

Such facts suggest a potential link between credit constraints in education and the financing of spousal education via early marriage. On that basis, we develop a matching and educational investment model—one that incorporates education subject to credit constraints with a fairly conventional spousal matching framework. In our frictionless matching model, individuals live for 2 periods, and education, spousal matching, and the timing of marriage are all endogenous. Marriage generates a surplus, so there is an incentive to marry young, but marriage involves a fixed start-up cost that cannot be borrowed regardless of its timing. This fixed cost makes marrying earlier more difficult, since there is return to experience and incomes grow with experience (i.e., age).

Based on our framework, couples can pool resources and finance the education of one of the spouses more easily when they marry early. This is made operational by our assumption that individuals who decide to pursue an education must finance it with their first-period income. Hence, it is relatively cheaper to educate one spouse, since the couples' joint income can be used to finance it. However, if it is optimal for both spouses to get educated, then the joint household income will need to finance the education of both spouses in addition to covering the marriage setup cost. As a result, early marriage would be desirable and feasible for couples among whom only one spouse would be educated. But it would likely be unfeasible (even though desirable) for couples for whom both spouses find it optimal to get educated.

The final component of our model is a fixed cost of entering a marital union. Marriage start-up costs were particularly relevant and often binding through the first half of the twentieth century in the United States, where, since postcolonial times, newlyweds were expected to move out of their parental homes to form their own households (for a description of US marriage norms until the twentieth century, see Shammas 2002). This was also commonly the case in many European societies (Hajnal 1965). Ruggles (2003) argues that children were often forced to wait until the father died in order to inherit the property and thus be able to marry. In the census data, less than 10% of newlyweds and 15% of young married individuals live with their parents or parents-in-law. This stands in stark contrast to other cultures, where multifamily households are still more the norm than the exception and with early marriages being prevalent despite limited economic resources. We argue that as the United States became wealthier and real housing prices fell, the fixed costs of marriage became less binding, thereby facilitating younger marriages by the middle of the twentieth century.[1]

[1] Some may argue that educational decisions may also involve fixed setup costs, but a large fraction of single individuals attending college in the United States continued

We are able to show theoretically that such a model generates a close relationship between marriage timing and the spousal educational gap. A fall in the fixed cost of marriage not only leads to more young marriages but also likely leads to an increase in the spousal educational gap. Similarly, a closing of the gender gap in the returns to education not only leads to a smaller gap in educational attainment of men and women but also makes some couples want to delay marriage.

The presence of a fixed cost of marriage, *F*, and the cost of education, *c*, along with credit constraints in the financing of both are the key elements of our model. Essentially, these costs taken together with the lack of market credit to cover them generate an interaction between—and a codependence of—when to marry and whether to get educated. These assumptions combined with changes in gender-specific returns to education are enough to explain the stylized facts that motivate our paper.[2] When incomes are low or the marriage start-up costs are relatively high, for instance, couples would struggle to get married early, even if they decide not to acquire any education. This would lead to few couples marrying early, with most couples being poorly and similarly educated. As the cost of marriage relative to income falls, this enables more couples to marry young.[3] What is novel in our model is that this lower cost of early marriage facilitates men's education by relaxing their credit constraints, leading to an increase in the fraction of couples among whom the husband is more educated than his spouse. As women's return to education increases, however, both spouses start to find getting educated optimal, and the total cost of early marriage and educating both spouses becomes binding. Consequently, more couples start to delay marriage.[4]

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living with family members, based on the census data, thus suggesting that moving out was related to marriage and not to educational decisions, at least historically.

[2] We recognize that our model abstracts from a number of other forces that were at play during the twentieth century, such as cultural changes, two large wars, important medical improvements, and changes in fertility control. Nonetheless, our focus in what follows is to examine the extent to which a standard frictionless matching model with plausible credit constraints can explain the trends of our interest.

[3] Of course, the idea that increases in income induced earlier marriage historically is also very much a Malthusian mechanism. And the interactions among marriage timing, fertility, and educational attainment lie at the heart of the demographic transition. Thus, the dynamics on which we shall focus here are consistent with the Malthusian income effect during the first half of the twentieth century. As we have already noted, the marriage age had fallen significantly by the 1950s. Consequently, the second half of the twentieth century became a period when marriage timing decisions were potentially overlapping with educational choices as well, thus adding a new layer to the traditional Malthusian effects. This would emphasize that marriage increasingly did not imply fertility, something that was strengthened with better access to contraceptives, as discussed by Bailey (2010).

[4] In our model, all those who acquire an education marry. Thus, our model is about educational attainment of men and women overall and not about some women

We then take our model to the data and show how the evolution in housing prices, costs of schooling, and returns to schooling for men and women can quantitatively replicate a substantial fraction of the fall in marriage age and the simultaneous increase in the spousal education gap for cohorts born between 1900 and 1940. This suggests that factors related to credit constraints may have played a role in this period. While our simulations correctly predict a reversal in those trends, they tend to occur about 10 years later than in actuality. We also overestimate the magnitudes when calibrating the income distribution based on 1900 or 1980 data. We do, however, show that if cohorts born after 1940 faced fewer credit constraints for schooling due to the rollout of student loan programs in the 1950s, we almost entirely replicate the increase in the age at first marriage and the decline in spousal educational difference among the more recent cohorts. We highlight that up to 20% of the increase in men's college attainment between 1910 and 1940 could be due to their wives financing their education.

Our simulations match a number of stylized facts that we document. For instance, in both the data and our simulations, the age at first marriage of more educated men falls more rapidly than that of less educated men. In addition, we show that increases in the legal minimum age for marriage decreased the fraction of couples among whom one spouse attended college, which is also consistent with our hypothesis.

Previous papers have tried to explain partner selection on the basis of human capital. According to the seminal work of Becker (1973), for instance, if there are complementarities in household production such that the return to being skilled increases with the skills of one's spouse, one should observe positive assortative matching. By contrast, if there are returns to specialization, the opposite pattern should be observed, with high-skilled men focusing on market work while their lower-skilled partners engage in home production. In the model we exposit below, spousal sorting will always be positive, although we will see that for young marriages there are returns to specialization through the cofinancing of education.[5] Such considerations of spousal education finance are prevalent in Zhang (1995) as well, where marriage age is differently correlated with men's wages depending on whether their spouses are working. In our model, this is due to endogenous educational and marriage timing decisions, not to different matching patterns in terms of underlying characteristics.

Most matching models that incorporate educational investment do not explore the role of education finance via marriage in the timing and patterns

with education being excluded from the marriage market (see, e.g., Hwang 2016; Bertrand et al. 2021).

[5] Low (2014) also shows that positive assortative in the marriage markets can be maintained throughout the income distribution if women's incomes rise or desired family size falls and when high-skilled women are able to compensate their partners for their lower fertility.

of spousal matching and marriage.[6] Papers in this strand include, but are not limited to, Konrad and Lommerud (2000), Iyigun and Walsh (2007), Chiappori, Iyigun, and Weiss (2009), Lafortune (2013), Chiappori, Salanie, and Weiss (2017), Chiappori, Dias, and Meghir (2018), and Bronson (2019).[7]

A number of papers have tried to explain the evolution in the age at first marriage in economics and sociology. Theoretical models include Mullin and Wang (2002), Olivetti (2006), Gustafsson (2001), and Conesa (2002). On the empirical front, Bailey, Guldi, and Hershbein (2015) provide the most comprehensive description of the trends of marriage timing and fertility over the twentieth century. However, their data are not disaggregated by men's education, which is required for testing our model. Bronson and Mazzocco (2019) explain the trends in marriage rates over the twentieth century using cohort sizes. None of these papers, however, link the longer-term patterns of the timing of marriage for men and women together with the spousal education gaps in the United States. Parro (2012) examines the long-term evolution of the gender educational gap in the United States along with changes in the age at first marriage. But he relates it to changes in the labor market only. Two contemporaneous works by Jelnov (2021) and Moro,

[6] There is also a large literature outside of economics on this topic relating marriage age and educational decisions. Martin (2000) argues that the delay in average age at first marriage differs by women's educational status: high-skilled women are postponing marriage, while low-skilled women are simply foregoing it. This is also in line with the predictions by Goldstein and Kenney (2001). Bitter (1986), using responses of married couples in interviews, argues that late marriages are more likely to involve heterogeneous spouses than earlier ones and that once this is controlled for, late marriages are more stable. Qian (1998) studies the patterns of assortative mating by age and education and how these changed between 1970 and 1990 in the United States. Accordingly, later unions promote stronger educational homogamy, as would be generated by our framework. Oppenheimer, Kalmijn, and Lim (1997) argue that marriage delay is more likely among men of race/schooling groups that experience higher career transition difficulties.

[7] Our model abstracts from search frictions to focus on the impact of credit constraints. It is clear that search frictions may exist, but we believe they are unlikely to explain the patterns we document, for a number of reasons. First, search frictions could be relevant if one must gather information regarding one's future spouse, as in Bergstrom and Bagnoli (1993). Diaz-Gimenez and Giolito (2013) use such a model to explain the evolution in the age difference between spouses. In that case, a delay in marriage would be consistent with higher variance in men's earnings in the two tails of our time period in the United States. It is unclear to us how search frictions and decreased equality would lead men to study more than their spouses. Second, search frictions would also not explain the micro patterns we document: more educated men would marry at a younger age when there is less variance in men's earnings, that is to say, when it would be more difficult for them to signal their value in the marriage market. Oppenheimer (1988) takes a similar approach to argue that recent delays in the marriage age of women is related to the fact that their "quality" now needs more time to be revealed as their labor market success becomes more and more relevant for their spouse. However, such an argument would still fail to explain the high marriage age around the turn of the twentieth century.

Moslehi, and Tanaka (2017) document the U-shaped pattern for the age at first marriage, but they do not link it to the changes in educational attainment.

One notable exception to the above is Edlund and Machado (2015), who show how laws that lowered the minimum marriage age allowed access to the birth control pill for women, thereby precipitating marriage, delaying marital fertility, and improving women's educational and occupational outcomes. Hence, Edlund and Machado focus on the potential impact of early marriage mainly on the educational attainment and economic well-being of married women. By contrast, our focus is on men: we emphasize that husbands were able to pursue higher education by marrying early and relying on their working wives for income support. Of course, as established by Edlund and Machado (2015), women working more and delaying childbirth could have been precipitated and, in significant part, enabled by access to contraceptives through early marriage.

In what follows, we focus on the timing of marriage and not fertility in part because our empirical results suggest that couples who "put the husband through" may not have had high fertility despite marrying early. Nevertheless, our model still relates to the large literature focused on the economic factors behind the baby boom (Greenwood, Seshadri, and Vandenbroucke 2005; Bellou and Cardia 2016; Siegel 2017). We suggest that there may have been forces explaining early marriages over this period other than simply higher desired fertility. Our model also differs from existing ones because it focuses on the barriers to entry into marriage due to setup costs and credit constraints involved with getting married and not on the relative costs and benefits of fertility. This is due to the fact that we endogenize educational attainment in addition to birth timing (to the extent that the latter is proxied by marriage timing). In addition, Bailey, Guldi, and Hershbein (2015) document that the declines in fertility in the 1960s are fairly in line with those recorded in the 1920s and 1930s in that the relevant cohorts averaged the same number of children born over their lifetimes. Accordingly, since the decline in fertility recorded during the 1960s is not exceptional by 1920s standards, it is also not likely the main or the sole driver of the closing of the gender education gap in the second half of the twentieth century.[8]

[8] In addition, Bailey, Guldi, and Hershbein (2015) document how the 1960s fertility decline differed from that in the 1920s: the emergence of a two-child norm and the increase in childlessness, the decoupling of marriage and motherhood, and the breakdown in the relationship between mothers' education and childbearing. Particularly, on the latter the authors conclude, "When comparing highly and less educated women, completed childbearing, childlessness, and the likelihood of marriage are much more similar today than in the early twentieth century. Despite these similarities, age at first household formation, age at first birth, and nonmarital childbearing diverged after 1960 by mothers' education, with more educated mothers more likely to delay household formation, motherhood, and childbearing within marriage" (275).

The rest of our paper is organized as follows: section II presents descriptive historical evidence about various aspects that relate to the PhT. Section III presents our theoretical framework. Section IV then calibrates our model to replicate the actual evolution of the timing of marriage and spousal levels of education during the twentieth century. Section V empirically documents further testable implications of our theory and some related hypotheses. Our last section concludes.

II. PhT-Related Trends and Facts

A. General Historical Trends

Demographers and historians have previously studied the long-term trends in marriage in the United States. Elliott et al. (2012), Cherlin (1992), and Coontz (1992) show that more frequent and earlier marriage was a phenomenon unique to the mid-twentieth century and that fewer and later marriages that defined the latter part of the twentieth century was a return to earlier trends a century ago. Bailey, Guldi, and Hershbein (2015) highlight this pattern for women, particularly in the United States.

While the age at first marriage was evolving as described above, cohorts were experiencing significant changes in their educational attainment. Parro (2012) describes the long-term evolution of the gender educational gap in the United States. Over this whole period, educational attainment was increasing for both men and women. For cohorts born before 1905, men averaged less education than women but had similar levels of college enrollment. For cohorts born between 1905 and 1955, men were more educated than women. Thus, as younger marriages were becoming the norm, men started attending school more than women. Consequently, spousal education levels and their gap reflected these trends.[9] Goldin, Katz, and Kuziemko (2006) describe the later closing (and reversal) of the gender college gap, which will also be part of our analysis.

Such stylized facts indicate a relationship between educational attainment and marriage timing decisions and, in particular, that wives' incomes during the early years of marriage may have facilitated husbands' education. In the remainder of this section, we first document some archival evidence on the prevalence of the PhT degree in the middle of the twentieth century. We then present indicative evidence that cofinancing of men's education by their wives occurred.

B. Archival Evidence

In reviewing the available archival historical evidence, one finds that "PhT diplomas" were awarded by a variety of US educational institutions in the late 1940s and the 1950s, including at North Carolina State, University of Florida, Wheaton College, Wofford College, and Stanford Law School.

[9] See fig. E.1 (figs. E.1–E.10 are available online) for spousal differences in overall educational and college attainment.

As a most visible documentation of this trend, for instance, the *New York Times* reported an exclusive on April 9, 1974, focusing on working women whose husbands were in school.[10] In an academic legal publication, Moore (1982) articulated how widespread it was for working women to support their husbands' education in the previous two or three decades in order to then argue why, on that basis, husbands' education should be considered marital assets in case of divorce. Specifically, he stated, "It has been common practice in this country during recent decades for a wife to put her husband through college and/or professional school. As one writer [Erickson] notes, '"[p]utting hubby through" college, law school, medical school, or other education program ("getting a Ph.T.," as it is sometimes called), appears to be a firmly entrenched American institution.' " (543).

The photograph shown in figure 1*A* is from the University of Florida Digital Archives. It depicts a "graduation" ceremony for the working wives of men earning their undergraduate degrees from the University of Florida some time in the 1950s. Figure 1*B* shows a PhT diploma that was awarded by Wheaton College to the working wives of students graduating from the school. As noted in the Wheaton College Archives, "in the years following World War II, returning soldiers enrolled at Wheaton College to pursue their college degrees. While the popular G.I. Bill assisted in paying the tuition and living expenses of the veterans, many of the former soldiers' wives also worked outside the home to support their families. Wheaton College President V. Raymond Edman observed this service, and to acknowledge the wives' significant contribution to their husbands' education, created the 'Putting Husbands Through' or 'PhT' honorary degree."

The ubiquity and importance of the PhT degree among a certain generation of US women can also be seen in relatively recent obituaries. In section E.2 of appendix E (apps. A–E are available online), we show eight obituaries of women born between 1920 and 1965 who are all recognized by their families for having earned a PhT. One of those reads, "Age 82, passed away peacefully at home on December 25, 2020. . . . She married her high-school sweatheart [*sic*] . . . in 1957 and moved to East Lansing so [he] could attend MSU. She earned her PhT degree (Putting Hubby Through) primarily as a teller at East Lansing State Bank and became acquainted with most of the campus notables of that time."[11]

C. Age at First Marriage by Educational Attainment

Another indicator that education finance through early marriage was relevant during the middle of the twentieth century is that the fall in marriage age during this era was strongest for relatively more educated men.

[10] "Wives Still Work As Spouses Study," by Nadine Brozan, *The New York Times*, April 9, 1974.

[11] Source: https://www.palmerbush.com/obituary/.

A PhT ceremony at the University of Florida

B PhT diploma from Wheaton College

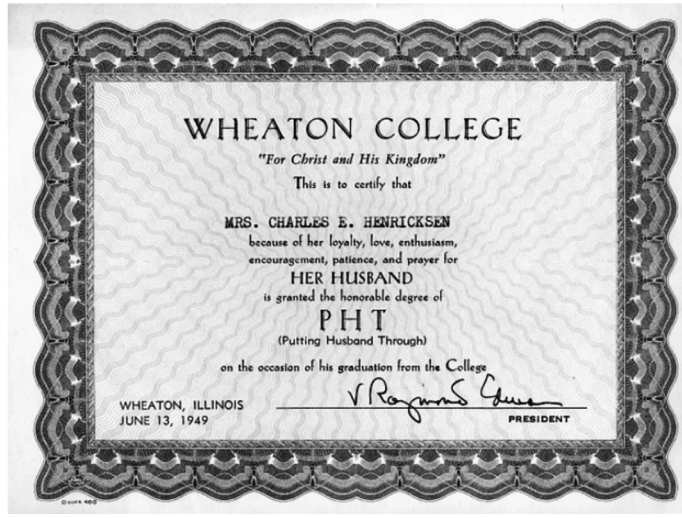

FIG. 1.—Archival evidence of the prevalence of the PhT. Sources: https://ufdc.ufl.edu/UF00032286/00001 (*A*); https://recollections.wheaton.edu/2017/05/putting-the-husbands-through (*B*). A color version of this figure is available online.

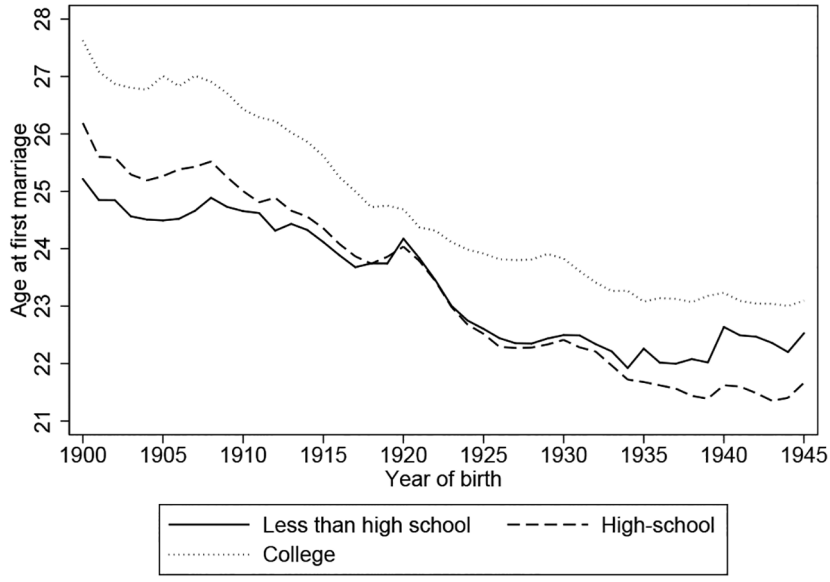

FIG. 2.—Median age at first marriage of males by educational attainment, by year of birth. This figure presents the median age at first marriage by educational attainment of men, which corresponds to the age at which the 50th percentile (using person-specific weights provided by the census) of a cohort has been married, assuming that all individuals who have not married will do so after the median age or not marry at all. It restricts the sample to men aged 30–60 in each of the 1960–80 US censuses who have nonmissing values for the variable "higrade." Ever-married men without an age at first marriage are also excluded. "Less than high school" includes men with eighth grade or less as the highest grade attained. "High-school" includes men who completed between ninth and twelfth grade. "College" includes all men whose highest grade was at least the first year of college. Source: IPUMS US censuses 1960–80.

In figure 2, we present the median age at first marriage of males by educational attainment.[12] As seen, more educated men lowered their age at first marriage the most. Men with at least some high school education used to marry about half a year later than those with only elementary or middle school degrees. During the later periods, these men were actually marrying

[12] To construct this figure, we only consider individuals aged 30–50 in each Integrated Public Use Microdata Series (IPUMS) census sample (Ruggles et al. 2021). We then take all of the individuals born in one year and measure the age at which the 50th percentile of the distribution married, assuming that all individuals who have not provided an answer married after the median age (or did not marry at all). Thus, the median age at first marriage we report is not, as usual, conditional on marriage but corresponds to the age at which 50% of the cohort had tied the knot. Also note that education and age at first marriage questions were asked only in the censuses of 1960, 1970, and 1980.

earlier than less educated men when this trend was at its trough. Men with at least some college education reduced their median age at first marriage by almost 4 years. This was a year more than for those with less than a high school education. Furthermore, our data show that college-educated men were the first ones who started delaying marriage significantly toward the end of our time span. These cohorts of men were the first ones whose likelihood of marrying college-educated women was much higher. This is consistent with the fact that financing the education of both spouses lowered the odds of early marriage.

The trends discussed above could be biased because we only measure educational attainment and age at first marriage for a restricted set of cohorts. Alternatively, figure 3 shows growth in educational attendance by marital status, information that is readily available for many more cohorts.[13] Here, we once again find that married young adult men most strongly altered their school attendance at a time when we observe younger marriages and greater differences in educational attainment between men and women. Specifically, for the 1940 cohort there were 10 times more married men who were in school than in 1900. By contrast, unmarried men were only around three times more likely to have been in school in 1940 than in 1900.

We also find that married men were more likely to be the only ones attending school than to have their partners also in school. Figure E.3 replicates figure 3 but this time separating married men by their spouses' school attendance status. It shows that the increase in school attainment occurred earlier and was more marked for individuals without a partner also in school.

D. Spousal Occupation and Education of Married Men

If education finance through early marriage was important in the middle of the last century, then it is also likely that the labor market roles of younger married women were geared more toward supporting their husbands in school.

Figure 4 shows that as the fraction of married men going to school increased, so did the fraction of their spouses who reported being in the labor force, as shown by the black lines of the figure.[14] While for cohorts born in the nineteenth century the fraction of spouses working was below 20% in many cases, this started to rise substantially as the twentieth century progressed, to reach almost 70% for cohorts born in 1950.

[13] For this figure, we take all men between the ages of 18 and 29 who report being in school and aggregate them by 10-year birth cohorts and marital status. We set 1900 as our base year and show the relationship between the number of men in each category compared with the value for that group in 1900.

[14] Since unemployment was rare among these women, one obtains very similar results by looking at those who were actually employed.

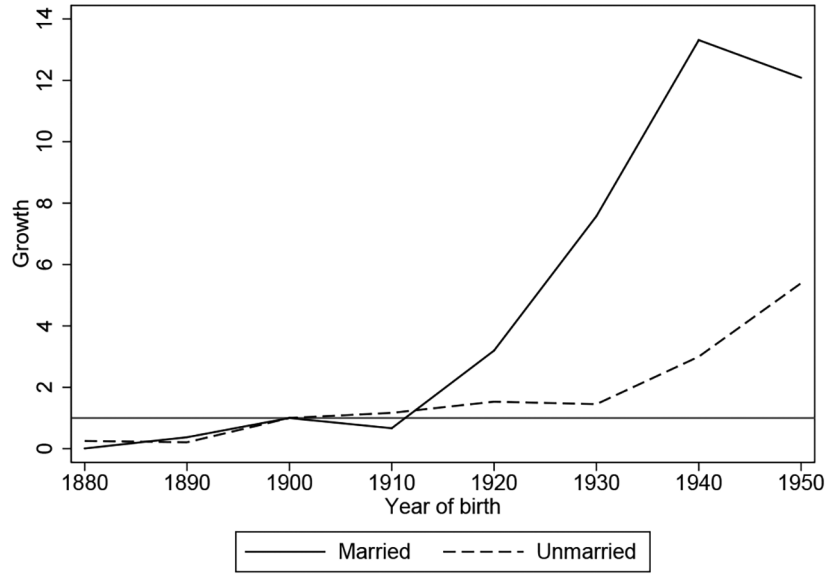

FIG. 3.—Growth in school attendance by marital status, by birth year. This figure presents the number of 10-year birth year bin 18–29 men who report being in school in the census by their marital status compared with those of the 1900–1909 birth cohort. It excludes all men who did not provide an answer to the "school" question. Married men are those who report being married with spouse present. Unmarried men are those who report another marital status. Person-specific weights are employed when computing totals. Source: IPUMS US censuses 1910–80.

For comparison, the dashed line in figure 4 shows the labor force participation of women whose husbands were not in school. One can see that the labor force attachment of spouses of men attending school was substantially higher than that of men not attending school during the period when the spousal gap in education increased. The difference is around 15 percentage points, suggesting that men attending school were much more likely to have a working spouse. In addition, one can also see that this difference arose for cohorts born after 1900, precisely the cohorts for whom the educational gap between men and women started to widen.

It is possible that the higher labor force participation rates of women married to men in school is entirely due to differences in fertility. If men in school were less likely to have children, their wives would thus have been more likely to be working. While this would, in and of itself, be interesting, we show that the pattern is very similar even after we restrict our attention to couples who did not have children living with them. Figure E.4 shows that while couples without children were more likely to have working wives irrespective of the schooling decision of the husbands, a similar gap opens

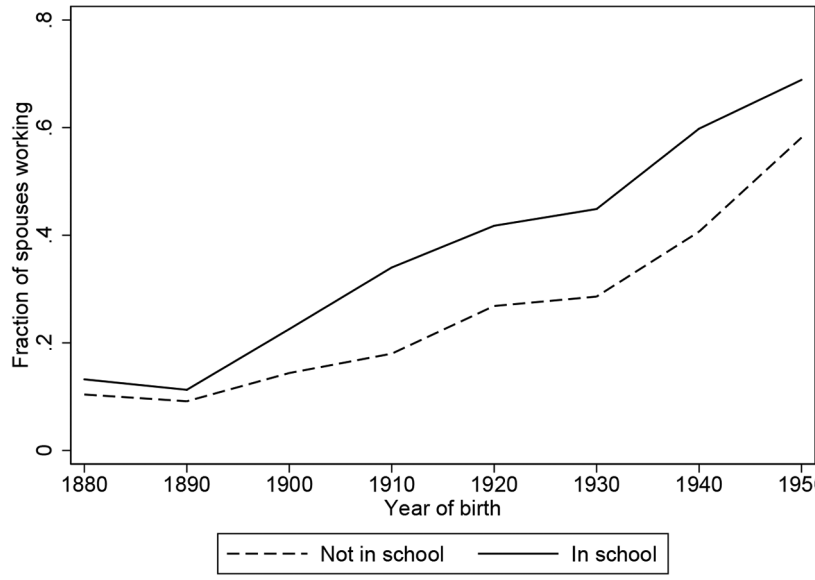

FIG. 4.—Fraction of married men whose spouses are in the labor force, by cohort and school attendance. This figure presents the fraction of married men 18–29 whose spouse reports being in the labor force by 10-year birth year bins. Married men are those who report being married with spouse present. The sample excludes men who do not answer the "school" question in the census. Person-specific weights are employed when computing fractions. Source: IPUMS US censuses 1910–80.

between studying and nonstudying husbands around the 1900 cohort and reaches a similar magnitude of 15 percentage points.

We also looked at the occupations reported by these women and compared them to the occupations of all women of the same age group in the censuses. We found clear evidence that the occupations of the spouses of studying men differed from those of the general female population, being particularly concentrated in secretarial and teaching employment and much less in service occupations. These correspond to occupations that were more portable, had limited career concerns, and were likely to have been relatively more in demand in college towns. In a more quantitative analysis, we report, conditional on these women working, their average occupational score. We present this graph in figure E.5 and show that men who were in school had spouses who had higher occupational scores, even conditioning on participation.

The labor force participation of women married to men in college played a role in increasing the fraction of men attending college. The dashed line in figure 5 shows that while less than 5% of in-school men were married in 1910, this number jumped to almost 30% by the 1930 cohort. About half

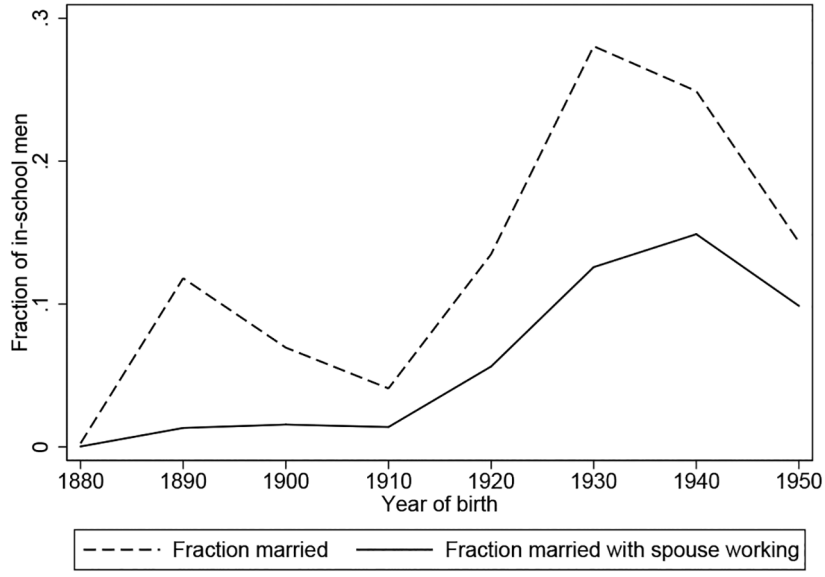

FIG. 5.—Fraction of in-school men who are married and who have a spouse working, by cohort. This figure presents the fraction of in-school men 18–29 who report being married and being married with a spouse in the labor force by 10-year birth cohort bins. Married men are those who report being married with spouse present. The sample excludes men who do not answer the "school" question in the census. Person-specific weights are employed when computing fractions. Source: IPUMS US censuses 1910–80.

of that increase was due to couples among whom the spouse was working, as shown by the solid black line.

III. The Model

A. The Setting

The economy is made up of individuals who live for 2 periods. All individuals derive consumption utility in both periods, and there is no time discounting. There exists a continuum of men and a continuum of women. The measure of men is normalized to unity and that of women to r, so that $r > 1$ denotes more women than men in the marriage markets and $r < 1$ represents the opposite.

Individuals can match and marry at the beginning of the first or second period, or they can choose to remain single.[15] They must marry someone

[15] As we shall illustrate below, the stable matching assignment will be strictly positive and invariant to when a couple chooses to marry. Hence, one can think of the marriage market here as one in which individuals get a marriage offer in the first period alone, with some of those offers involving a 1-period delay. Put differently, the

of their own age.[16] Marriage involves a fixed cost of F, $F > 0$, and individuals cannot borrow to finance their marriage (nor, as we shall discuss immediately below, their education). This cost must be paid out of their marital output contemporaneously.

As we stated in the introduction, it is the combination of a fixed cost of marriage, F, and the cost of education, c, with credit constraints in the financing of both that matters in our model. These costs, taken together with the lack of market credit to cover them, are what generate an interaction between—and a codependence of—when to marry and whether to get educated for individuals. This is the key novelty of our framework.

That young individuals are credit constrained in their decision to marry and to finance their education can be validated through a number of different sources. Ruggles (2003) documents that many US men had to delay marriage until their fathers died in order to inherit property and thus be able to marry. Green and Wachter (2005) describe the high levels of down payment that were required to buy a house before the end of the Second World War. In appendix A, we document that men who had lower levels of wealth, as proxied by their race or immigration status, married at an older age, for each educational attainment level. As for credit constraints in schooling, Lochner

model does not require any first-period commitment among "engaged" couples who choose to delay marriage to the second period. The transferability of utility and the supermodularity of the couples' production, which we shall expound on further below, ensures that all the matchings and unions that occur in both periods are stable. Also, in all that follows we shall abstract from divorce. Incorporating it into our analysis would be straightforward but would not have a material impact on our main qualitative results. As shown in Chiappori et al. (2017), anticipated divorce laws affect only the intertemporal distribution of utility and not the expected utility of individuals in a Pareto-optimum divorce world.

[16] In the United States, more than 50% of marriages are between spouses who are less than 3 years apart in age, and more than 70% are within 10 years of age (which will be our approximation of a generation when turning to the data), thus validating this assumption. If one were to extend the model below to allow cross-cohort marriages, it is inevitable that one would have to make additional assumptions. On the surface and as things stand, the only benefit of being able to marry someone from a different cohort is the ability to finance one's own education when young by marrying an older spouse who would help to cover the education cost. But the downside of such a marriage is that it would only last 1 period. Hence, ceteris paribus individuals who might consider this option would most likely be the lowest-ranked individuals on the long side of the market in their generation. Nevertheless, unless sex ratio imbalances flip between the two generations, such individuals would be hard pressed to find singles among the older cohorts whom they would consider marrying. This all illustrates that in order to make additional inferences regarding the impact of cross-cohort marriage on the phenomena we are studying here, one would have to make further specific assumptions, such as preferences for marrying people in different cohorts, the evolution of the sex ratios from one generation to the next, and so on. This is beyond the scope of our paper, and given that within-cohort marriages are predominant in our sample, we entertain only such marriages in our analytics.

and Monje-Naranjo (2012), Carneiro and Heckman (2002), and Solis (2017) all point to the existence of credit constraints restricting college access. Herrington, Hendricks, and Schoellman (2021) show that family wealth was a better predictor of college attainment for the pre-1945 cohorts. This reinforces the idea that credit constraints were very relevant for college attainment decisions during at least the first half of the twentieth century.

B. Endowments, Preferences, and Matching

In each period, individuals derive utility from consumption, u^i, $i = \text{m, f}$. They are born with idiosyncratic (raw) efficiency units of labor endowment, y for men and z for women. The first-period raw endowments of men, y, are distributed over the support $\{y_{\min}, y_{\max}\}$ according to some distribution G_{m}. Similarly, the first-period raw endowments of women, z, are distributed over the support $\{z_{\min}, z_{\max}\}$ according to the distribution G_{f}. If individuals choose not to get educated, we assume that their efficiency units of labor can still potentially grow in the second period as a result of experience or wisdom of age. Hence, the efficiency labor endowments of men and women in the second period respectively equal $\hat{y} = xy$ and $\hat{z} = xz$, where $x \geqslant 1$.

Individuals may choose to get educated in the first period, regardless of their marital status and getting educated costs c per person, $c > 0$. Costs of education cannot be covered through borrowing, although married couples can pool their resources to finance the education of either or both of the spouses. We let the education premium be gender specific and denote it by e_i, $i = \text{m, f}$, such that $e_i \geqslant 1$. For educated individuals, the efficiency units of labor endowment equal e_i times their unaugmented labor endowments in the period after they get educated (by default, the second one); that is, $e_{\text{m}}xy$ for men and $e_{\text{f}}xz$ for women. On that basis, the potential per-period incomes from labor income are given directly by the efficiency units of labor endowments.

Now consider a man with a potentially augmented endowment of y who is matched with a woman with a raw endowment of z. The "marital production" technology is given by $h(y, z)$. Abstracting for now from the marriage setup cost F and the cost of education c, a couple (y, z) can generate the intratemporal output $h(y, z)$, which then is allocated to individual utilities u^{m} and u^{f}, where we assume h to be increasing in each argument and exhibiting supermodularity in y and z. Finally, utility is transferable between spouses, a property that drastically simplifies our analysis.[17]

If a man with an endowment of y remains single and uneducated, his intratemporal output is given by $h(y, 0)$, and if a woman with an endowment of z remains single and uneducated, her intratemporal output is given by $h(0, z)$. By h supermodularity, $h(y, z) > h(y, 0) + h(0, z)$.

[17] See Chiappori, Iyigun, and Weiss (2015) for a precise investigation of the transferability issue.

C. Lifetime Marital Output

We now define the lifetime output married couples can generate on the basis of their education levels and timing of marriage. We do so based on the formulation given immediately above while specifically accounting for the costs of marriage and education when and if they are incurred.

To start off, if an uneducated man and an uneducated woman get married when young (i.e., in the first period), the marital output generated over the 2 periods by such a couple can be computed as follows:

$$S_1^{\mathrm{U}}(y,z) = h(y,z) + h(xy,xz) - F. \tag{1}$$

In equation (1), the first and second terms on the right-hand side represent the total output generated by the married couple (y,z) in the first and second periods, respectively. The second-period output of this couple is higher because of the experience factor, x. Couples will be able to choose this option when their marital output in the first period covers the fixed cost of marriage F, namely, $h(y,z) > F$.

By contrast, if an uneducated man and an uneducated woman get married when they are older (i.e., in the second period), their marital output generated over the 2 periods would equal

$$S_2^{\mathrm{U}}(y,z) = h(y,0) + h(0,z) + h(xy,xz) - F. \tag{2}$$

For such a couple, the first-period payoff is simply the sum of their output as singles, and the second-period payoff reflects the benefit of the returns to experience as older adults, as in equation (1). This choice will be feasible when $h(xy,xz) > F$, since the fixed cost of marriage will be incurred only in the second period.

Alternatively, a couple could marry young, and one of the spouses could get educated when married. Then,

$$S_1^{\mathrm{H}}(y,z) = h(y,z) + h(xye_{\mathrm{m}},xz) - F - c \tag{3}$$

would apply to couples who marry young and among whom only the husband is educated. This would be feasible when $h(y,z) > F + c$.[18]

However, if an educated man marries an uneducated woman later in life in the second period, then we would have[19]

[18] An analogous expression would apply to couples married young and among whom only the wife is educated:

$$S_1^{\mathrm{W}}(y,z) = h(y,z) + \eta h(xy,xze_{\mathrm{f}}) - F - c.$$

[19] A similar expression would apply to the later marriage of an educated woman and an uneducated man:

$$S_2^{\mathrm{W}}(y,z) = h(y,0) + h(0,z) + \eta h(xy,xze_{\mathrm{f}}) - F - c.$$

$$S_2^{\mathrm{H}}(y,z) = h(y,0) + h(0,z) + h(xye_{\mathrm{m}}, xz) - F - c. \tag{4}$$

This choice will be feasible when $h(y,0) > c$ and $h(xye_{\mathrm{m}}, xz) > F$. Note in particular that since such a couple marries when they are older, the husband's cost of education, c, needs to be financed solely through his own first-period income, $h(y,0)$.

By extension, one would get a similar lifetime marital output when considering the union of educated couples who marry early or late. In particular,

$$S_1^{\mathrm{HW}}(y,z) = h(y,z) + h(xye_{\mathrm{m}}, xze_{\mathrm{f}}) - F - 2c \tag{5}$$

would apply to couples who marry early and among whom both spouses are educated. And

$$S_2^{\mathrm{HW}}(y,z) = h(y,0) + h(0,z) + h(xye_{\mathrm{m}}, xze_{\mathrm{f}}) - F - 2c \tag{6}$$

would apply to couples who marry late and among whom both spouses are educated. The case described by equation (5) would be feasible when $h(y,z) > F + 2c$, whereas the one in equation (6) would be feasible when $h(y,0) > c$, $h(0,z) > c$, and $h(xye_{\mathrm{m}}, xze_{\mathrm{m}}) > F$. Here, since such a couple marries when they are older, the husband's as well as the wife's cost of education, c, need to be financed solely through their own first-period incomes, $h(y,0)$ and $h(0,z)$, respectively.

Denote $S^*(y,z) = \max\{S_1^{\mathrm{U}}, S_2^{\mathrm{U}}, S_1^{\mathrm{H}}, S_2^{\mathrm{H}}, S_1^{\mathrm{HW}}, S_2^{\mathrm{HW}}\}$ as the maximum lifetime utility that is preferred and feasible by the couple. Note that all couples would like to marry early if they can afford it because $\forall J = \mathrm{U}, \mathrm{H}, \mathrm{W}, \mathrm{HW}$, $S_2^J < S_1^J$, and so as y and z increase, we will observe that S^* will switch from late to early marriages. Also note that for $e^{\mathrm{m}} > e^{\mathrm{f}} > 1$, there will always be a threshold value of y and z above which couples will prefer more education and S^* will switch from less to more education. It is easy to show that $\partial^2 S(y,z)/\partial y \partial z > 0$ in all of the cases because of the supermodularity of the function h. We also note that $\partial^2 S(y,z)/\partial y \partial z$ will be more positive for earlier marriages, holding constant educational attainment. Likewise, it will be more positive for more education, holding constant marriage timing. Nonetheless, it is also possible that as y and z increase, S^* switches from early marriage and less education to later marriage and more education. If this occurs, it is because the return to y will be more increasing in z for later but more educated marriage than for earlier and less educated marriage, since this is the only reason why couples would prefer the first option. Thus, S^* will be supermodular, since y and z will either involve remaining within a type of union where $\partial^2 S(y,z)/\partial y \partial z > 0$ or switching from one type of union to another where the latter has more complementarity between y and z than before. Thus, individuals will sort positively in the marriage market in both periods regardless of when they can marry.

D. The Equilibria

1. Who Matches with Whom

As we have just established and given transferable utility and the complementarity of individual incomes generating surplus, a stable assignment must be characterized by positive assortative matching (Becker 1981). That is, if a man with an endowment y is matched with a woman with an endowment z in the first or second period, then the mass of men with endowments above y must exactly equal the mass of women with endowments above z. This implies the following spousal matching functions:

$$\begin{aligned} y &= G_{\mathrm{m}}^{-1}[1 - r(1 - G_{\mathrm{f}}(z))] \equiv \phi(z), \\ z &= G_{\mathrm{f}}^{-1}\left[1 - \frac{1}{r}(1 - G_{\mathrm{m}}(y))\right] \equiv \psi(y). \end{aligned} \tag{7}$$

For $r > 1$, all men are married and women with endowments below $z_0 = G_{\mathrm{f}}^{-1}(1 - 1/r)$ remain single.[20] Women with endowments exceeding z_0 are then assigned to men according to $\psi(y)$, which indicates positive assortative matching.[21]

2. Educational Choices and Timing of Marriage

While there would be positive sorting in the marriage markets based on spousal endowment levels and all matched couples would like to marry as soon as possible because of the marital surplus involved, not everyone may be able to afford to marry young as a result of the fixed cost of marriage that needs to be incurred. Furthermore, if education is optimal for either spouse or both of them, the total cost of education would need to be financed out of household output as well. Thus, we next establish who marries when on the basis of key parameter values. We also demonstrate that the positive spousal matching profile would remain intact even when some spousal pairings at the lower end of the endowment distribution cannot afford to marry young and those higher up might choose to delay marriage so either or both spouses get educated.

For heuristic purposes and the rest of our analysis, we assume that the marital production function $h(y, z)$ is homogenous of degree γ in its arguments, with $\gamma > 1$ (i.e., $h(y, z) = (y + z)^{\gamma}$). In addition, we let men's endowments, y, be uniformly distributed over the support $[y_{\min}, y_{\max}]$ and women's

[20] This would be the case even if all individuals could afford to marry in the first or second period.

[21] Since in what follows we will not focus on intrahousehold allocations directly, we will remain agnostic about whether the sex ratio, r, exceeds 1. For the stability conditions in matching and within-period allocations of household output, see app. B.

endowments, z, be uniformly distributed over the support $[z_{\min}, z_{\max}]$. Then we define λ as a matching function, $\psi(y)$, scalar such that, $\forall\ y \in [y_{\min}, y_{\max}]$ and $\forall\ z \in [z_{\min}, z_{\max}]$, if $(y - y_{\min})/(y_{\max} - y_{\min}) = (z - z_{\min})/(z_{\max} - z_{\min})$, then $z = \psi(y) = \lambda y$.

We can now define the affordability thresholds as follows:

1. $y^{\mathrm{HW}} \equiv [(F + 2c)/h(1, \lambda)]^{1/\gamma}$, where $y \geq y^{\mathrm{HW}}$ implies that a couple can marry young, regardless of their educational choices;
2. $y^{\mathrm{H}} \equiv [(F + c)/h(1, \lambda)]^{1/\gamma}$, where $y^{\mathrm{HW}} > y \geq y^{\mathrm{H}}$ implies that a couple can marry young only if the husband acquires an education or neither spouse does; and
3. $y^{\mathrm{U}} \equiv [F/h(1, \lambda)]^{1/\gamma}$, where $y^{\mathrm{H}} > y \geqslant y^{\mathrm{U}}$ implies that a couple can marry young only if both spouses forgo education.

Note that $y^{\mathrm{HW}} > y^{\mathrm{H}} > y^{\mathrm{U}}$ and that $\partial y^j/\partial F > 0$, $j = \mathrm{HW}, \mathrm{H}, \mathrm{U}$.

Next, we define π as the gender gap in the education premium such that if $e_{\mathrm{m}} \equiv e \geq 1$, then $e_{\mathrm{f}} = \pi e$. On this basis, we make two further simplifying assumptions. First, if a gender gap in the returns to schooling exists, it disadvantages women. Second, all individuals can marry later in life. More formally, we have the following.

Assumption 1. $\pi \leqslant 1$.

Assumption 2. $y_{\min} \geq [F/xh(1, \lambda)]^{1/\gamma}$.

Now consider the optimality thresholds, according to which individuals—in conjunction with whom they will form a union—determine their optimal education levels.

As long as $e > 1$ and $\pi e > 1$, there will exist thresholds values of y below which couples prefer less education and above which they prefer more education. In particular, let us define the threshold where $S_1^{\mathrm{HW}} = S_1^{\mathrm{H}}$ as

$$\hat{y}^{\mathrm{HW}} \equiv \frac{1}{x}\left[\frac{c}{[eh(1, \lambda\pi) - h(e, \lambda)]}\right]^{1/\gamma} \tag{8}$$

and where $S_1^{\mathrm{H}} = S_1^{\mathrm{U}}$ as

$$\hat{y}^{\mathrm{H}} \equiv \frac{1}{x}\left[\frac{c}{[h(e, \lambda) - h(1, \lambda)]}\right]^{1/\gamma}. \tag{9}$$

Note that these thresholds are the same for early and late marriages. That is, $S_2^{\mathrm{HW}} = S_2^{\mathrm{H}}$ is also given by equation (8) and $S_2^{\mathrm{H}} = S_2^{\mathrm{U}}$ is defined by equation (9) as well. In addition, when π is small enough, we can verify that $\hat{y}^{\mathrm{HW}} > \hat{y}^{\mathrm{H}}$.

If the returns to experience, x, is large enough, we can define two additional thresholds: $\grave{y}^{HW}$ as the endowment level at which $S_2^{HW} = S_1^H$ and $\grave{y}^H$ as that at which $S_2^H = S_1^U$, where

$$\grave{y}^{HW} \equiv \left[\frac{c}{x^\gamma[eh(1,\lambda\pi) - h(e,\lambda)] - [h(1,\lambda) - h(1,0) - h(0,\lambda)]}\right]^{1/\gamma} \quad (10)$$

and

$$\grave{y}^H \equiv \left[\frac{c}{x^\gamma[h(e,\lambda) - h(1,\lambda)] - [h(1,\lambda) - h(1,0) - h(0,\lambda)]}\right]^{1/\gamma}. \quad (11)$$

We can immediately establish that $\grave{y}^{HW} > \hat{y}^{HW}$ and $\grave{y}^H > \hat{y}^H$. Likewise, when x is large enough, we have $\hat{y}^{HW} > \grave{y}^H$. We can also show that $\partial\hat{y}^i/\partial e < 0$, $\partial\grave{y}^i/\partial e < 0 \ \forall \ i = HW, H$, while $\partial\hat{y}^{HW}/\partial\pi < 0$, $\partial\grave{y}^{HW}/\partial\pi < 0$.

All individuals take into account whom they will marry and choose an education level that is optimal and in their feasible set. Recall that S^* denotes the optimum and feasible choices made by couples. Now, let $\grave{e}^{HW}$ and $\grave{e}^H$ represent men's education premia that solve equations (11) and (10) for y_{max}, respectively.

Next, consider the case in which the following two parameter restrictions hold throughout:

ASSUMPTION 3. $e > \grave{e}^H$.

ASSUMPTION 4. $y_{max} > c^{1/\gamma} > \hat{y}^H$.

Our first assumption ensures that some men would always find it optimal to get educated. The second one, however, dictates that some men who may find it optimal to get educated cannot afford to do so on their own (and without getting married). In addition, recall that the affordability thresholds, y^U, y^H, and y^{HW}, decline monotonically with lower costs of education, F, while changes in F do not influence our optimality thresholds, $\hat{y}^H$, $\hat{y}^{HW}$, $\grave{y}^H$, and $\grave{y}^{HW}$.

In section III.E, we shall more specifically define and characterize the optimal and feasible education and marriage choices in three distinct equilibria and along the spousal endowment profiles.

3. Comparative Statics

We have already noted that a novelty of our model is the interaction between factors driving educational decisions and those driving marriage timing. We next focus on two parameters, F and π, and formalize their impact on the unique equilibrium outcomes in the spousal education and marriage timing profiles.

PROPOSITION 1. If F falls, early marriages will become more common. A lower F will also lead to an increase in the educational gap between husband and wife when $y^{HW} > \grave{y}^{HW}$.

Proof. We have already shown that $\partial y^{HW}/\partial F, \partial y^{H}/\partial F, \partial y^{U}/\partial F > 0$. But our optimality thresholds are unaffected. As these affordability thresholds fall with declines in F, we will observe younger marriages. For those with endowments $y < \hat{y}^{H}$, these early marriages will continue to involve uneducated individuals. However, for $y \in [\hat{y}^{H}, c^{1/\gamma})$, a fall in F may also influence educational choices. Specifically, when y^{H} falls below the threshold for acquiring an education as a single ($c^{1/\gamma}$), a fall in F leads to an increase in men's educational attainment because these men are now able to afford studying thanks to their wife's incomes. Such couples would thus switch from S_1^{U} to S_1^{H}. For those couples with endowments $y \geq c^{1/\gamma}$, a fall in F can also increase the gender gap in education as long as we do not observe a shift from S_1^{H} to S_1^{HW}. One can show that such a shift will not occur when $y^{HW} > \grave{y}^{HW}$. This is due to the fact that in that case, a fall in y^{HW} will never lead to a shift from S_1^{H} to S_1^{HW}. QED

PROPOSITION 2. If the returns to women's education increase, the gender education gap will shrink. This will also be accompanied by delays in marriage when $y^{HW} > \grave{y}^{HW}$.

Proof. We have already shown that $\partial \hat{y}^{HW}/\partial e_f, \partial \grave{y}^{HW}/\partial e_f < 0$. Affordability thresholds, on the other hand, are unaffected by women's returns to education. For those with endowments $y < \hat{y}^{H}$, nothing will change. For those with endowments $y \in [\hat{y}^{H}, c^{1/\gamma})$, we would potentially observe only a change from S_1^{H} to S_1^{HW} but no change in the timing of marriage, since individuals in that range cannot acquire an education without marrying young. Finally, for those with endowments $y \geq c^{1/\gamma}$, some couples will prefer delaying marriage and educating both spouses (i.e., choosing $S^{*} = S_2^{HW}$) instead of electing S_1^{H} as e_f rises. This will be the case when those who would like to make this trade-off cannot afford early marriage when educating both spouses, namely, when $y^{HW} > \grave{y}^{HW}$. QED

E. Three Theoretical Equilibria

Under assumptions 1–4, as F monotonically declines and e_f increases, our model yields three distinct equilibria, characterized as follows.

E1. $y^{U} > y_{max}$;

$$S^{*} = \begin{cases} S_2^{H}, & \forall\ y \in [c^{1/\gamma}, y_{max}]; \\ S_2^{U}, & \forall\ y \in [y_{min}, c^{1/\gamma}]. \end{cases} \tag{12}$$

E2. $y^{HW} > y_{max} > c^{1/\gamma} > y^{H} > y^{U} > y_{min}$ and $e < \grave{e}^{HW}$;

$$S^{*} = \begin{cases} S_1^{H}, & \forall\, y \in [y^{H}, y_{max}]; \\ S_1^{U}, & \forall\, y \in [y^{U}, y^{H}); \\ S_2^{U}, & \forall\, y \in [y_{min}, y^{U}). \end{cases} \tag{13}$$

E3. $y^{HW} > y_{max} > c^{1/\gamma} > y^{H} > y^{U} > y_{min}$ and $e < \grave{e}^{HW}$;

$$S^{*} = \begin{cases} S_2^{HW}, & \forall\, y \in [\grave{y}^{HW}, y_{max}]; \\ S_1^{H}, & \forall\, y \in [y^{H}, \grave{y}^{HW}); \\ S_1^{U}, & \forall\, y \in [y^{U}, y^{H}); \\ S_2^{U}, & \forall\, y \in [y_{min}, y^{U}). \end{cases} \tag{14}$$

For the derivations of these critical thresholds and the existence and uniqueness of the three equilibria, see appendix B.

In equilibrium E1, the cost of marriage is prohibitively high, as a consequence of which couples can only marry when they are older. They get educated if they can pay for its cost on their own. As the cost of marriage drops, however, we end up in equilibrium E2. In this equilibrium, some couples can afford to marry early and educate the husband. In equilibrium E2, the spousal education gap is wider, particularly among those who marry younger. In this equilibrium, men with endowments between y^{H} and $c^{1/\gamma}$ are those who could not afford to get a college education without the contributions of their wives. Against the backdrop of all men who get educated—all those with endowments in the range of y^{H} to y_{max}—this helps to put in perspective how important the PhT phenomenon was in men's educational attainment.

As women's return to education increases and eventually exceeds the threshold $\grave{e}^{HW}$, as in equilibrium E3, the optimality thresholds for educating both partners fall. This leads to couples at the top of the endowment distribution to start delaying marriage in order to educate both partners. Thus, we now see a fall in the spousal educational gap as well as in the fraction of couples marrying earlier.

In figure 6, we present graphically the combinations of F and π and how they lead to different types of equilibria. We do this by setting $\lambda = 1$, $c = 0.4$, $\gamma = 1.5$, and $e_m = 1.4$. These parameter choices are consistent with the calibrations we shall present and discuss below. We also assume that men and women's endowments are drawn from a uniform distribution with lower and upper bounds of support between 0.065 and 0.4. This guarantees that assumptions 1–4 are satisfied. Figure 6*A* presents the fraction of couples marrying in the first period, while figure 6*B* shows the fraction of couples

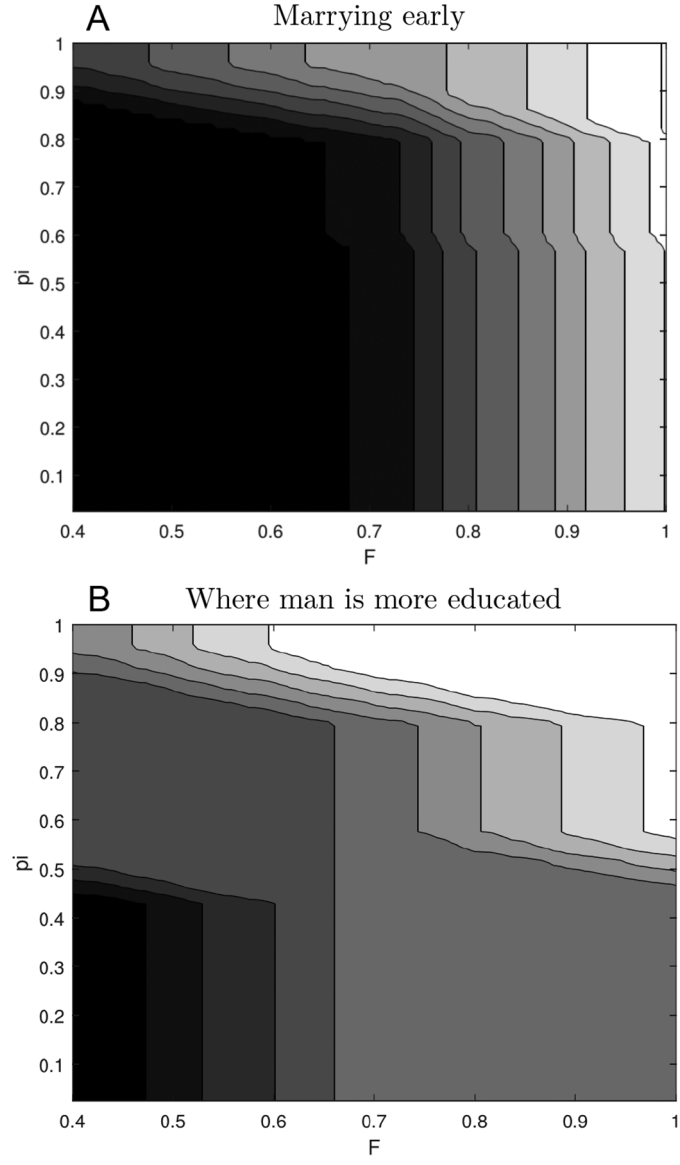

FIG. 6.—Fraction of couples with given characteristics by F and π. This figure shows the fraction of couples who marry early (A) and where the man is more educated than his spouse (B) as simulated in our model where we set $\lambda = 1$, $c = 0.4$, $\gamma = 1.5$, and $e_m = 1.4$. Men and women's endowments are drawn from a uniform distribution between 0.065 and 0.4. Higher values are represented as darker shades.

among whom the husband is more educated than the wife. Higher values are represented as darker shades.

As both panels show, when F is large and π is small, we observe a small fraction of couples marrying early and a small fraction of couples among whom the husband is more educated than his wife. As F falls but π remains low, we observe an increase in the fraction of couples who marry in the first period, which occurs together with an increase in the fraction of men who are more educated than their wives. This occurs because women in this group help their spouses overcome credit constraints in education. Finally, as low F is combined with higher π, we observe that the fraction of couples marrying early falls while women's educational attainment rises and the spousal education gap narrows.

Interestingly, some of the predicted changes from this simple model matches the empirical facts we detailed earlier. To further illustrate, we graphically depict in figure 7 what the three equilibria imply in terms of population shares (and along the endowment distribution). Given that we assumed the endowment distributions of men and women are uniform over their respective supports, the shift from equilibrium E1 to E2 increases men's average education and reduces the age of marriage for all, although the change is more marked for educated men. Likewise, the share of college-educated men who marry young falls significantly with the shift from equilibrium E2 to E3.

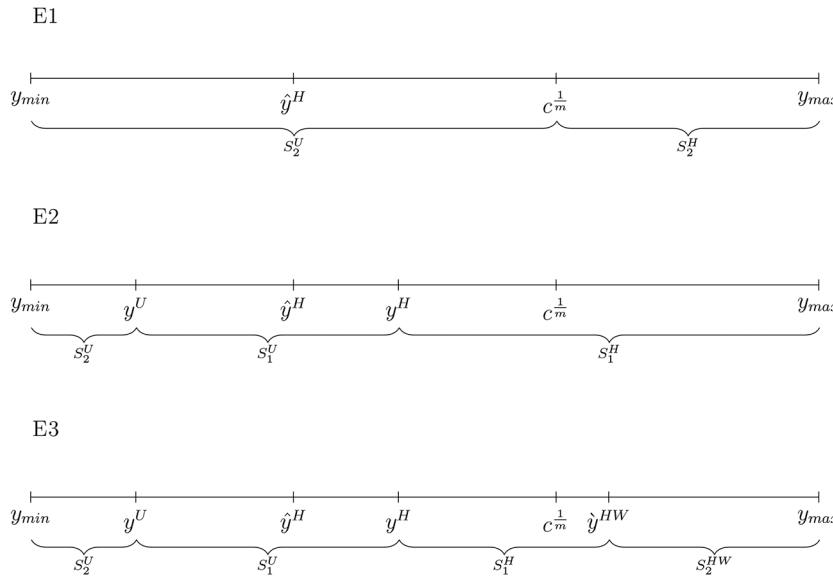

FIG. 7.—Equilibria E1–E3.

IV. Calibrating the Long-Run US Marriage Patterns

We next utilize our model to explain the long-run trends in marriage and education and see how much of the observed patterns in the United States could be explained by a model that takes into account the cofinancing of the education of married men by their wives.

A. The Setup and Numerical Choices

To simulate our model, we need to simplify some elements of our data to match the characteristics of the model. To that end, we first discretize the decisions made by individuals in our periods of interest to better align with our framework. To start with, we use 10-year windows to refer to the decisions of when to marry and study. In particular, we use the ages between 16 and 25 as the "early" period and that from 26 to 35 as the "late" period.[22] The early period corresponds broadly to the years in which Americans were completing high school and attending college. We use a comparable period for the late window as a period when very few individuals in our sample were studying and many were marrying. Given that couples typically involve spouses at different ages, we focus on the age of the husband. We also discretize the educational attainment decision and focus on completing at least 4 years of college or university education. While this is a simplification, it appears to match the overall trends we described earlier, and it corresponds to the type of decision that could likely interact with the marriage decision. We set $\gamma = 1.5$ so that $h(y, z) = (y + z)^{1.5}$. This degree of spousal characteristic complementarity is comparable although somewhat lower than the previous parameterizations in the literature (e.g., Chiappori, Iyigun, and Weiss 2009).

Next, we turn to historical data to pin down the parameters of our model: F, c, e_m, and e_f. In doing so, we abstract from the enormous changes in gross domestic product (GDP) that the United States has experienced over the period, and we define all parameters as a fraction of GDP per capita.

As a proxy for F, we use the median home price (relative to GDP per capita), averaged over the years the cohort was 20–29 years old. The median home price estimates are from Shiller (2015), and we work with the 10% benchmark as a plausible minimum amount of equity that would be required by banks as mortgage down payment.[23] We divide 10% of the median house price by GDP per capita over the same period.

[22] While a 10-year difference between those marrying early and late may appear large, it is less than the interquartile difference in men's age at first marriage until the 1910s and less than twice that interquartile for the cohorts born after that.

[23] We worked with the 10% benchmark as a plausible minimum amount of home equity required for a home purchase. Anecdotal evidence suggests that banks typically required higher equity. For instance, home mortgage finance in the early 1950s involved an average of minimum of 20% down.

Next, to parameterize our cost of schooling, c, we consider the sum of annual public college tuition and the unskilled wage rate as a share of GDP per capita. The annual unskilled wage rate, which proxies for forgone earnings, is derived from Officer and Williamson (2017), and the college tuition cost is based on the ratio of public tuition per median family income when the cohort was 20 years old (as provided by fig. 7.10 in Goldin and Katz 2008). Officer and Williamson (2017) provide only an index for nominal unskilled wages, which we transform into a nominal annual wage by using a 2008 wage of $25,000 for unskilled workers. We then take four times this salary and divide it by 10 times nominal GDP per capita. We do this in order to approximate the fraction of full-time working years that a student would have sacrificed by attending college. The data provided by Goldin and Katz (2008) are for tuition in relation to median household income. Thus, we transform this into a GDP per capita figure by using the data available for these two variables. For men's returns to schooling, e_m, we once again use Goldin and Katz (2008). In particular, following table 2.7 in Goldin and Katz (2008), we identify the return to a 4-year college degree for all men 30 years after their birth.

Obtaining an estimate of returns to college, consistent over time, for women is much more challenging. The relevant literature has identified that working women's return to schooling was close to—and if anything slightly larger than—that of men. Goldin and Katz (2000) document this for the beginning of the century, and Mincer and Polachek (1974) and Card (1999) do so for the post-1950 era. All of these studies base their estimates solely on women who were in the labor force at the time of the survey. However, in order to get a more accurate estimate of women's returns to schooling, one would need to also account for the returns to schooling of women who were not working. Thus, as an approximation, adjusting men's returns with a penalty for lower labor force participation seems aligned with the estimates cited above. In addition, to avoid this estimate being endogenous to marriage decisions, we use the ratio of labor force participation of married women to men for the 1900 and the 1980 cohorts and fit a linear trend to predict the behavior over the century. While we recognize that this does not solve all endogeneity concerns, we believe that it ensures that movements in marriage age and schooling decisions between the two end points of the period are not driving the changes in our measure of women's returns.[24]

In figure 8, we show the evolutions of e_m, e_f, c, and F over our sample period by birth cohort. The cost of marriage, F, and women's returns to schooling, e_f, are the two parameters that vary the most over time. The cost

[24] We could make women's returns larger than those of men (predifferences in labor force participation) without much of an effect on our results. In fact, the calibration fit would even improve for the second half of the twentieth century as long as increases in women's returns outpace those of men by no more than 30%.

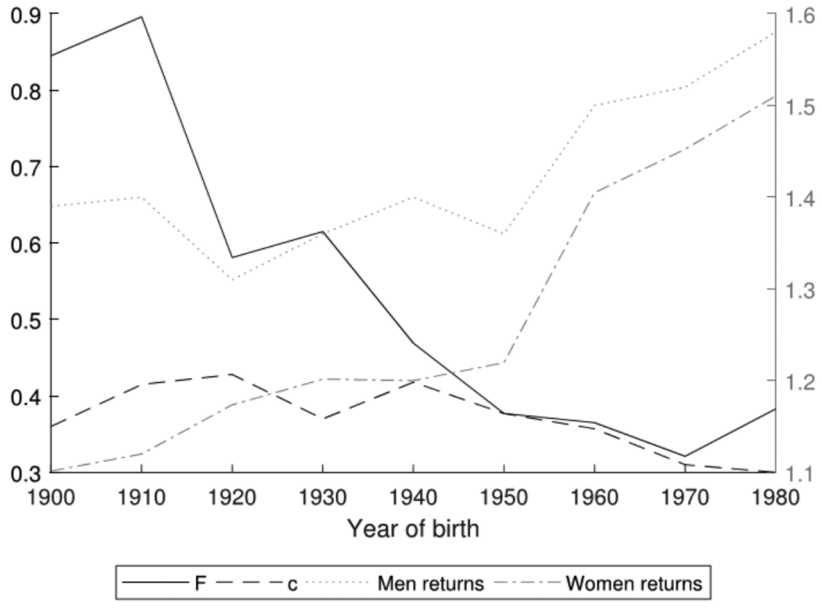

FIG. 8.—Parameter evolution. Women's returns are computed as the fraction of working women from each cohort times ($e_m - 1$) added back to 1. Source: *F* (*left axis*) from Shiller (2015) and Officer and Williamson (2017); returns to schooling (*right axis*) from Goldin and Katz (2008); cost of schooling (*left axis*) from Goldin and Katz (2008) and Officer and Williamson (2017).

of housing in the United States has seen a large decline in proportion to real incomes until the recent cohorts. By contrast, we find relatively little movement in the cost of attending college. It is slightly higher during the middle of the period, since this corresponds to the Great Compression and unskilled wages were higher in that period. Similarly, we observe a V-shape pattern in returns to schooling of men, as documented by Goldin and Katz (2008). The returns to college for men first fall and then rise again in the most recent periods. What changes dramatically is the return to women's schooling, which increases from being barely profitable to a level almost as high as that of men, mirroring the increase in the labor force participation of women over this period.

As for the remainder of our parameter selections, to emphasize the role of differential returns to education, we set the sex ratio, *r*, equal to 1. Hence, taken together with the fact that men and women share the same endowment distributions, λ equals 1 as well. As a consequence, the difference between men and women in the calibrations below are solely driven by the gender difference in educational returns e_m and e_f.

For returns to experience, we pick $x = 1.3$ for those without college in our baseline simulation. This corresponds to the annual wage earnings of

men aged 26–35 as a share of annual wage earnings of those aged 16–25 without college education. For those with a college education, we set $x = 1.55$. This represents the annual wage earnings of men aged 26–35 as a share of the annual wage earnings of those between 16 and 25 among college-educated men.[25]

We then assume that male endowments follow a lognormal distribution with a lower support bound of 1, so that $\gamma = 1.5 > 1$ actually implies higher marital output for higher spousal endowments. We select the parameters of the lognormal distribution to minimize the sum of the squared difference between the simulated and actual fraction of couples (i) who marry early, (ii) among whom the husband is more educated than the wife, and (iii) for whom both spouses get a college education among the 1900 cohort. This leads us to set $\mu = 0.0952$ and $\sigma = 0.2926$.

B. The Results

1. Baseline Calibration

Figure 9*A* shows the simulated results. As shown, our model is very good at generating the type of correlation between marriage timing and educational differences between spouses observed in the data. We find that our model also generates the three types of equilibria we wished to emulate and their evolution over time. In particular, we find that early marriages first increased for cohorts born after 1910 and then started to fall after 1950. Similarly, we find that men increased their educational attainment compared with their spouses until the 1950s. This gap began to narrow subsequently, a trend that continued through the 1980 cohort.

Comparing these simulations to the actual data,[26] as shown in figure 9*B*, reveals that while we match well the timing and the type of changes, our quantitative results exaggerate the magnitudes seen in historical data. For example, our simulation predicts that we would go from 40% of couples marrying early in 1900 to 100% in the middle of our sample period to then fall back to close to 70% by 1980. By contrast, census data suggest that the United States went from 45% of early marriages in 1900 to 70% in 1940

[25] In our theoretical presentation earlier, recall that we opted to treat the returns to experience as identical for educated and uneducated workers. However, there is a well-documented difference in the growth of wage incomes by education levels that favors more educated individuals. For further details, see Connolly and Gottschalk (2006).

[26] We restrict our sample to those who were between the ages of 30 and 50 in the 1940, 1970, and 1980 censuses. We augment those data with the 2008–14 American Community Surveys, as only the latter provide information on the age at first marriage and the educational attainment of both spouses. We classify couples as married before age 25 on the basis of the age of the man at first marriage. We then separate couples depending on college attainment of both spouses.

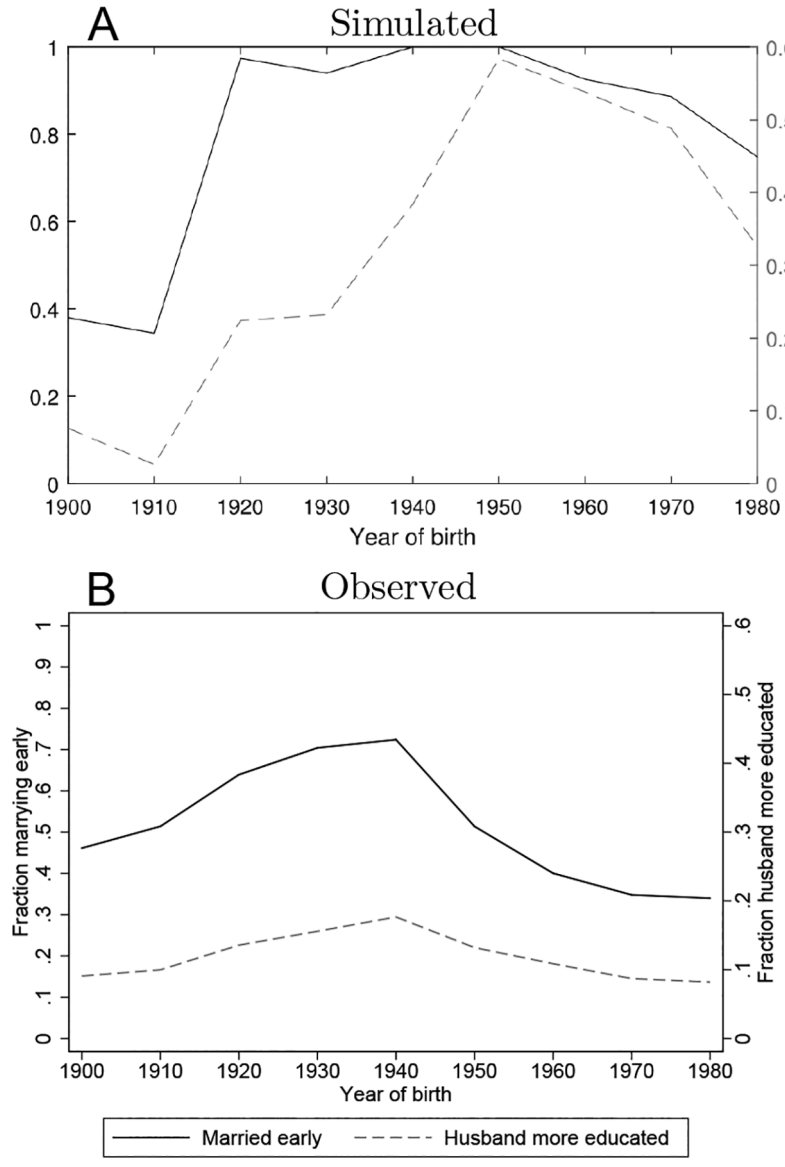

FIG. 9.—Simulated and actual probability of marrying early and spousal education gap. *A* shows the fraction of couples who marry early and for whom the man is more educated than his spouse as simulated in our model where we set $\lambda = 1$ and $\gamma = 1.5$, with the rest of the parameters evolving as in figure 8. Men and women's endowments are calibrated to a lognormal distribution bounded from below by 1 that best fits the 1900 distribution, which implies that $\mu = 0.0952$ and $\sigma = 0.2926$. In *B*, we produce the empirical counterpart where we report the fraction marrying before 25 and the fraction of couples for whom the man has completed at least the first year of college and the woman has not by 10-year birth cohorts. These are computed using a sample of men aged 30–50 where age at first marriage and educational attainment is reported. Person-specific weights are employed when computing fractions.

and back to 35% at the end of the period. Similarly, we also appear to overshoot the increase in educational disparity between men and women. On that score, our simulations predicts that the fraction of couples among whom the husband is more educated than his spouse was 5% in 1900, rose to 55% in 1940, and then fell back to 30% in 1980. Actual data, by contrast, suggest an almost identical increase initially with about 5% of couples among whom the husbands completed college in 1900, reaching a peak of 18% in 1940 but then falling back to 8% in 1980.

Our model also matches the overall pattern that motivated our puzzle: the decrease in marriage age occurs at a time when both men's and women's educational attainment levels were rising. In figure 10*A*, we show that our model replicates the above-described pattern occurring while both gender's probability of choosing to educate is rising. Men's college attainment increases in our model from 10% in 1910 to 90% around 1970. Women's college attainment rises from 10% in 1910 to 50% by 1980, but the increase occurs at a slower pace than that of men. When comparing this to the actual data in figure 10*B*, we observe that, once more, our model exaggerates the facts in the middle of the century (when men's college attendance increased to only around 60%). However, in both graphs we find that the gap between men and women opens up with the 1920 cohort and starts closing with the 1940 generation. One major difference that our model cannot replicate is that there is a reversal of the college gender gap that starts to take hold with the 1960 cohort. This is due to the fact that in our model the returns to schooling for women are always below that of men.

2. Calibration without Education Cofinance

To quantify how important the cofinancing of spousal education was in explaining educational patterns over the century, we next reestimate our model but this time forcing men and women to finance their education out of their own first-period incomes. Figure 11 shows the fraction of men who would attend college based on a simulation in which cofinancing is possible ("With PhT") and the counterfactual where it is not ("Without PhT"). For comparison, we also include the actual fraction of men attending college. This exercise suggests that a large fraction of the increase in men's college attainment between 1920 and 1950 is due their wives cofinancing their schooling. For the 1940 cohort, we find that only around 10% of men would have gone to college without the PhT, but close to 50% attended (both in reality and in our simulation). The figure also shows that by 1980 the role of the PhT had completely dissipated.

How much of the increase in men's education over this period can be explained by the PhT? Comparing these simulated outcomes with one another suggests that up to 80% of all college-educated men in 1940 may have benefited from their spouses' contributions to household income and their

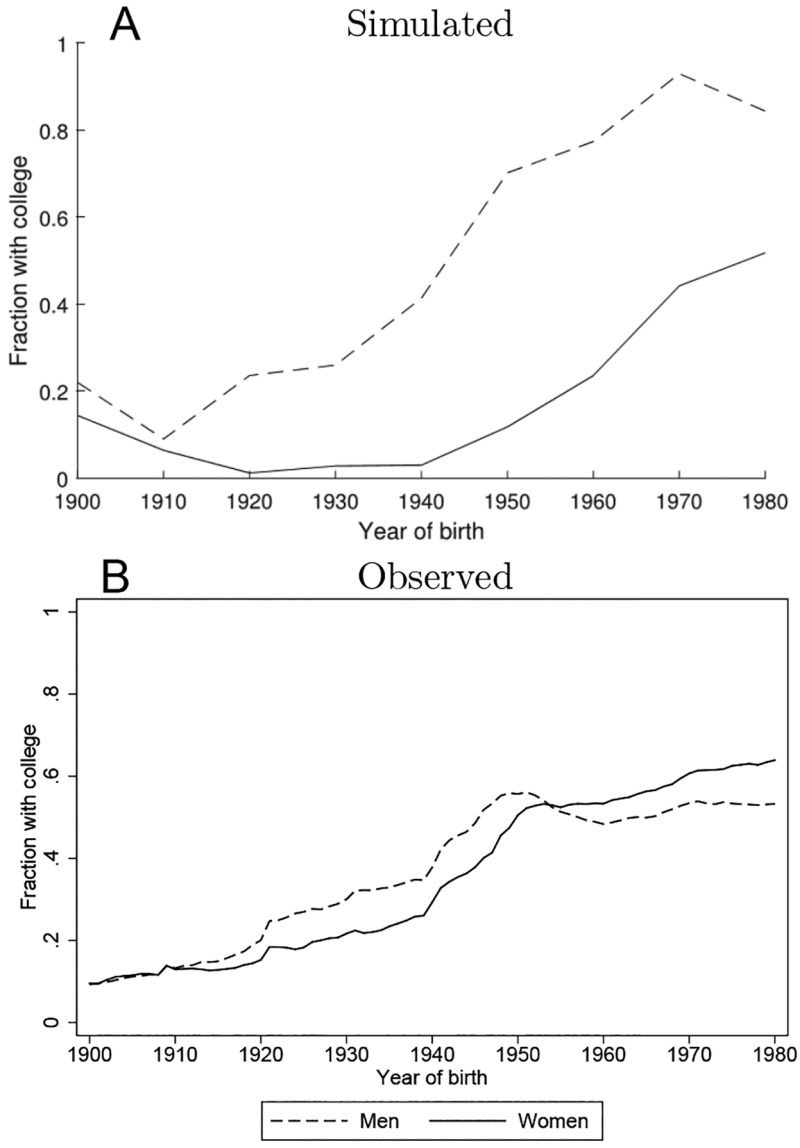

FIG. 10.—Simulated and actual probability of attending college, by gender and birth cohort. *A* shows the fraction of men and women who acquire an education as simulated in our model where we set $\lambda = 1$ and $\gamma = 1.5$, with the rest of the parameters evolving as in figure 8. Men and women's endowments are calibrated to a lognormal distribution bounded from below by 1 that best fits the 1900 distribution, which implies that $\mu = 0.0952$ and $\sigma = 0.2926$. In *B*, we produce the empirical counterpart where we report the fraction of men and women who have completed at least the first year of college by 10-year birth cohorts. These are computed using a sample of men aged 30–50 where age at first marriage and educational attainment is reported. Person-specific weights are employed when computing fractions.

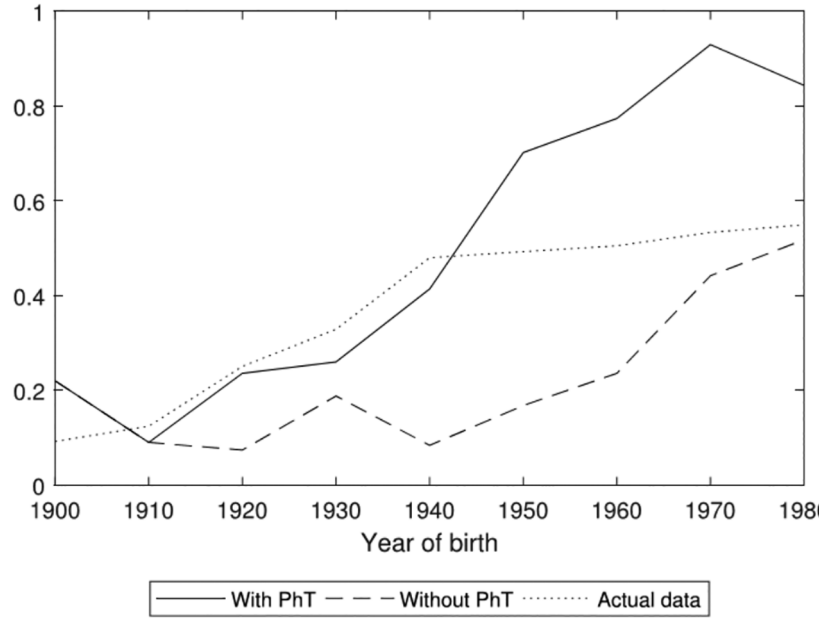

FIG. 11.—Fraction of men attending college, actual data and simulated (with and without PhT). This figure shows the fraction of men who attend college as simulated in our model where we set $\lambda = 1$ and $\gamma = 1.5$, with the rest of the parameters evolving as in figure 8. Men and women's endowments are calibrated to a lognormal distribution bounded from below by 1 that best fits the 1900 distribution, which implies that $\mu = 0.0952$ and $\sigma = 0.2926$. The "Without PhT" curve is obtained by forcing individuals to finance their education out of their own first-period endowment. "Actual data" refers to the real observed data, as shown in figure 10.

education. Clearly, our stylized model overstates the role of the PhT, as those who sought college degrees began to have more outside options to finance their education, especially after the 1950s.

To put things in perspective, consider figure 5. The fraction of men who were in school and married by birth cohort is shown by the dashed line. This group of men is relevant because they represent the upper bound of the fraction of men who could have benefited from the PhT phenomenon on which we focus. By contrast, the fraction of men in school whose wives were working is depicted by the solid line.[27] This group of men represents a good approximation of the actual fraction whose education was financed, at least

[27] Reassuringly, these numbers are very close to the fraction of college-educated men who married before age 25 and those who married early a spouse with less than a college degree, respectively.

partially, by their wives.[28] As shown, nearly 20% of all college-educated men born between 1920 and 1940 had working spouses. Hence, for these cohorts up to about 20% of men acquiring college education may have been enabled to do so because of their spouses' cofinancing of their education.

3. Calibration over an Alternative Time Frame

As discussed, a model with credit constraints in marriage and education appears to fit well the qualitative descriptions, but it overestimates the impact of the cofinancing of education through early marriage. This is due, in large part, to the fact that the calibration produces a relatively right-tailed distribution of endowments. This implies that when the cost of marriage falls, a large majority of couples are able to marry at a young age by 1940. This is not the case in the actual data.

We explore the robustness of these results to a change in the calibration period. Figure E.6 replicates the graphs in figure 9 but this time using 1940 (fig. E.6*a*) and 1980 (fig. E.6*b*) data to calibrate the model. In both cases, we replicate the main result that both curves are inverse-U shaped and highly correlated with each other. In figure E.6*a*, we observe that using 1940 data to calibrate the model allows us to approximate more closely the quantitative changes observed in the data. We never observe all couples marrying in the first period. We also find that, at most, 14% of couples comprise more educated husbands. However, the decrease in both variables occurs at a later date (in 1970) than in our main specification. This is because we calibrate our population to be poorer in terms of endowments to match the 1940 data, but this also implies that fewer couples at the upper end of the distribution elect to delay marriage and educate both spouses in the later period. In figure E.6*b*, we see that calibrating the model to 1980 generates an even more marked exaggeration than when we used the 1900 data. We replicate the timing of our original calibration with the peak of both variables occurring in 1950, but we now observe that, from 1920 to 1950, all couples marry early. We also eliminate all differences in educational attainment in 1900. Overall, we see this exercise as indicative that our general conclusions are unaffected by the year of the data selected to calibrate the distribution of endowments.

4. Calibrations with Alternative Parameter Specifications

How relevant and important were credit constraints in driving the long-term US trends in marriage timing and spousal education differences? In figure 12, we recalibrate our estimates for some alternatives related to credit

[28] Note that, on the one hand, this could be the upper bound of men who benefited from the PhT to the extent that some working wives may not have pitched in to cover their husbands' education. On the other hand, this could be a lower bound to the extent that there were also married men whose wives contributed financially to their education in the past, although they were not working at the time of the survey.

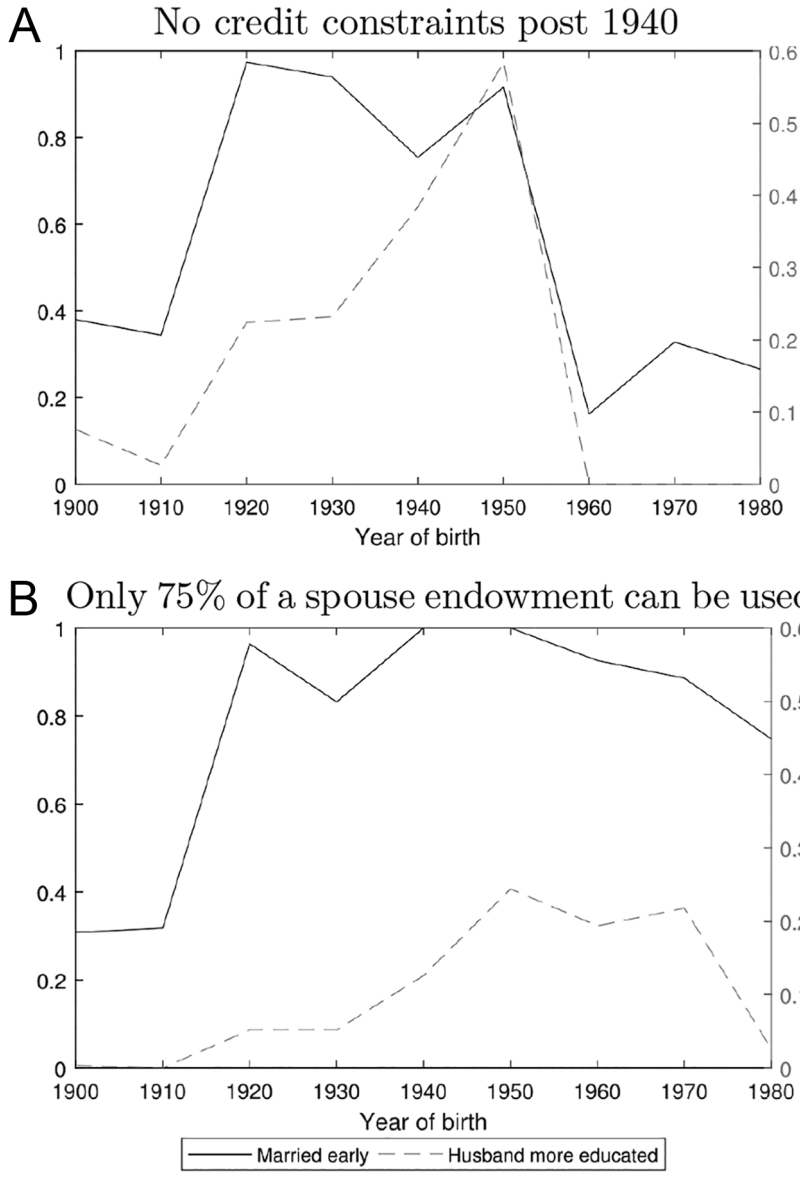

FIG. 12.—Simulated probability of marrying early and spousal education gap, by alternative restrictions to credit. This figure shows the fraction of men who marry in the first period and who are married in the first period with a spouse who does not acquire an education among all men who acquire an education as simulated in our model where we set $\lambda = 1$ and $\gamma = 1.5$, with the rest of the parameters evolving as in figure 8. Men's and women's endowments are calibrated to a lognormal distribution bounded from below by 1 that best fits the 1900 distribution, which implies that $\mu = 0.0952$ and $\sigma = 0.2926$. In *A*, we allow all individuals to afford going to college in the first period for cohorts born after 1940. In *B*, we allow only that 75% of a spouse's endowment can be used to finance education and marriage costs.

constraints. In figure 12*A*, we allow all individuals born in 1940 or later to be able to get educated if they wish, irrespective of their first-period endowment as long as their lifetime earnings are sufficient to cover the cost of education, *c*. With this, we try to capture the fact that the United States implemented a system of federal loans that started with the National Defense Student Loan program (now the Perkins Loan program) in 1958, which was subsequently augmented in 1965 with the first higher education act, guaranteed student loans. Thus, one could postulate that credit constraints in education became less binding for the 1940 cohort and beyond. Figure 12*A* indeed suggests that such a dynamic makes the post-1950 trends even more similar to the actual data. The 1980 cohort now shows rates of early marriage of only 25% and no couple involves educated husbands only, compared with 35% and 8% in the actual data, respectively. This suggests that in addition to higher returns to women's returns to schooling, less binding credit constraints may have played a role for the most recent cohorts.

As an alternative test of the role of credit constraints in education, in figure 12*B* we relax the assumption that wives can use all of their income to support the education of their husbands. Instead, we assume that women can devote only 75% of their incomes to the education of their husbands. As shown, while this does little to influence the rates of early marriage over the period, it reduces significantly how much we overestimate the spousal education gap. Thus, even a 25% reduction in the amount of funds available for financing education during early marriage considerably bridges the quantitative gap in the difference between our simulations and actual data. As such, our model can match not only the qualitative but also the quantitative patterns in terms of the share of couples among whom the husband is more educated.

While our model emphasizes the key role of credit constraints in education finance, there were other important changes in the US marriage markets over this period. We focus on increases in the likelihood of divorce and cultural changes that lowered returns to marriage. In figure E.7, we show how incorporating exogenous divorce influences our calibrated results. In figure E.7*a*, we allow for early marriages to be dissolved in the second period by a random shock.[29] Divorcees simply receive their singles payoff, which also reflects the assumption that divorce laws are not redistributive. For rates of divorce, we use the marriage dissolution rates for young marriages in each birth cohort. That probability is virtually zero percent for the first cohort, but it increases for all following cohorts up to 1940, after which it plateaus at 40% for the subsequent cohorts. As shown, incorporating divorce into the model significantly reduces our overestimation of the prevalence of early marriages. By the 1980 cohort, we predict that less than 50% of couples

[29] We do not entertain remarriage because doing so would entail a host of other complexities that are beyond the scope of our paper.

would marry early when the real datum is closer to 35%. We also slightly reduce the peak in terms of the spousal education gap, although not by much. This suggests that while higher rates of divorce could explain part of the patterns we document, it has limited impact on couples that engage in the PhT behavior. That is, at least in part, due to the fact that we assume that marital decisions are taken jointly. Matters could be different if the wives had some autonomy in deciding whether to finance their husbands' education and if they were consigned to get their singles payoff in case of divorce.

In figure E.7*b*, we linearly lower γ, the degree of complementarity within marriage. We do this to explore whether the cultural shift away from marriage in the late 1960s—as proxied with lower marital gains—can help to explain the facts in which we are interested. In particular, we start at our original value of 1.5 for the first four birth cohorts but end up at 1.2 for the 1980 cohort. We show that this modification reduces the simulated proportion of couples with educated husbands only, getting it closer to the observed values in the post-1950 era. However, since a lower γ reduces the incentives for women to get educated, this modification does little to alter the proportion of couples who marry early, even somewhat worsening our calibration fit for later cohorts.

While our model captures a number of prevalent features of the evolution of marriage and education in the twentieth century we established here, it fails to capture some others identified by the earlier literature. For example, both Bailey, Guldi, and Hershbein (2015) and Lafortune, Salisbury, and Siow (2022) demonstrate that the relationship between women's education and marriage age and likelihood changed dramatically over the last century. This is primarily driven by the fact that all individuals eventually marry in our model, and we maintain a constant and invariable return to women's education on the marriage markets throughout.

V. Further Empirical Evidence

There is some further related empirical evidence one can bring to bear on our main hypothesis. One involves whether changes in minimum marriage age laws across states and over time influenced the timing of marriage and the spousal education gaps along the lines of our theory. There are also related hypotheses in the existing literature that emphasize the roles of the GI Bill and the baby boom in some of the trends upon which we have focused. Below, we discuss these in turn.

A. Changes in Minimum Marriage Age Laws

Based on our model, more couples would choose to delay marriage if it became either impossible or more difficult to marry young. This would lead to changes in educational attainment as well. In the case of equilibrium E2 in section III.E, only those with endowments above $c^{1/\gamma}$ would now be able

to educate the husband. This would lead to a decrease in the fraction of couples among whom only one of the members is educated and an increase in the fraction of couples without any education. In the case of equilibrium E3, we would observe something similar, but there could also be an increase in the fraction of couples who both get educated.

We explore this corollary by using variations in state laws that restricted early marriages with parental consent over time.[30] We find that an increase in the minimum age at which women (but not men) could marry reduced the fraction of couples marrying early (before age 25, as in our simulations). It also increased the fraction of couples with only one spouse attending college. This finding is robust to the inclusion of state-time trends, the inclusion of controls for access to abortion, and restricting the sample to whites only, who were more likely to benefit from the PhT. We also see a similar pattern when focusing only on nonmigrants. In appendix D, we detail our empirical strategy and results.

Overall, we find these results to be consistent with the fact that for a generation of American men and women, early marriage enabled couples to jointly invest in only one spouse's education.

B. Related Hypotheses

1. The GI Bill

One may be worried that military service in the Second World War could have influenced both the marriage age (due to men getting married before heading to war) and educational choices (thanks to the GI Bill). To verify that this is not the case, we replicate figures 2 and 4 but this time excluding veterans. Figure E.8 shows that the men who acquired more education lowered their marriage age the most, even when the veterans are excluded from the sample. Similarly, figure E.9 shows that the labor force participation of women married to in-school men rose equally strongly for a sample that excludes veterans. Overall, this suggests that veterans' behavior is not driving the patterns we document.

2. The Baby Boom

Since the period we study corresponds to the baby boom, one may also be concerned that it would have been impossible for women to finance the schooling of their husbands due to women having children and less time to work. Bailey, Guldi, and Hershbein (2015) show that the age at first birth fell over this period.

[30] Note that the PhT was more relevant for cohorts born between 1920 to 1950. Moreover, there was almost no change for these cohorts in marriage age laws without parental consent. For these reasons, we focus only on limits to marriage age with parental consent.

Did the earlier marriage age translate into higher fertility, which would have made it more difficult for women to cofinance the husband's education? The first thing we can check is the number of own children living in households of young men (aged 18–29) when in school. We find that in 1900 this corresponded to an average of 0.8 children, which was 0.3 less than that for those who were not in school. We also see an increase for the cohort born in 1930, but more muted than for those who were not in school. These results are presented in figure E.10.

More importantly, we compute the age at first birth of the spouses of men by these men's educational attainment. To do this, we use only cohabiting children of couples and assume the oldest cohabiting child of a couple is their oldest child. These results are presented in figure 13. They show that while all women had births earlier starting with the 1915 cohort, those married to college men saw a much less dramatic decrease over that period. Furthermore,

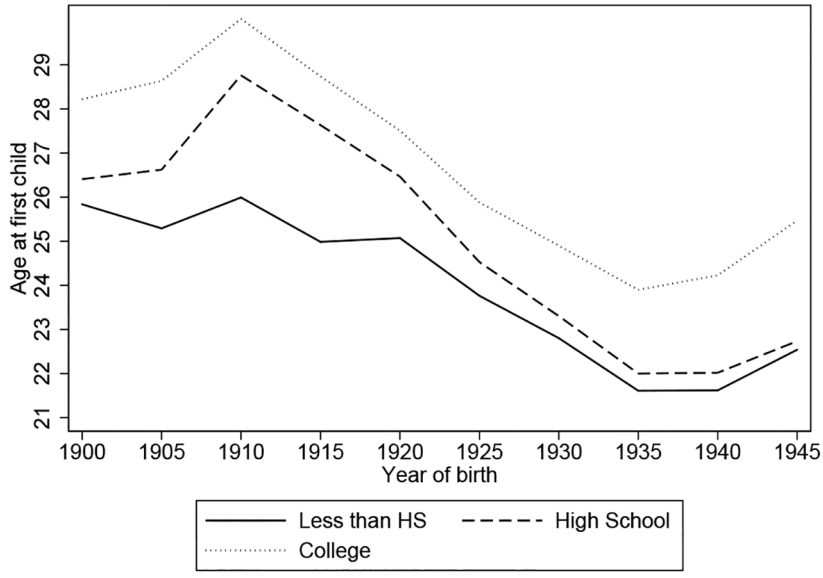

FIG. 13.—Age at first child of spouses of men, by educational attainment and cohort. This figure presents the average spousal age at first birth by educational attainment of men, where age at first birth is proxied by the age of the spouse minus that of the eldest child in the household. It restricts the sample to men aged 30–60, born between 1900 and 1980, in each of the 1940–80 US censuses who have nonmissing values for the variable "higrade." Ages at first child that were below 14 and above 50 were excluded. "Less than HS" includes men with eighth grade or less at the highest grade attained. "High School" includes men who completed between ninth and twelfth grade. "College" includes all men whose highest grade was at least the first year of college. Source: IPUMS US censuses 1940–80.

even for the 1935 birth cohort—for which the age at first birth was at its minimum—spouses of high school men had their first child at age 22 and those of college men at age 24, which suggests limited overlap between fertility and schooling.

If a couple wishes to maximize the number of their children, having a larger spousal age gap may be ideal. However, to cofinance education, a smaller age difference would be best, as older women would be less likely to be studying and more likely to be earning a higher wage. In fact, we observe a substantial decrease in the age difference of spouses over this period. While men born in 1900 married on average a woman who was 4 years younger, this fell to around 2 years by the cohort of 1945. This implies that less than 40% of spouses of men who attended college married before their twenty-first birthday, which was the age at which they could access the birth control pill without marriage in many states. In those states, marrying earlier was also a way to be able to obtain contraception.[31] Thus, as Edlund and Machado (2015) have argued, early marriage may have provided easier access to contraception to some women. The aforementioned authors argue that access to the birth control pill enabled women to delay childbirth and raise their own education levels. By contrast, we document and theorize that this also facilitated the PhT phenomenon, thereby allowing married women to delay their first childbirths and finance their husbands' education.

VI. Conclusion

The mid-twentieth century marks an unusual era in the United States when age at first marriage fell while educational attainment increased quite dramatically, particularly for men. It is quite puzzling that the marriage age fell in the United States when high school completion and college enrollment of men trended up, especially because standard models of labor and human capital acquisition do not help to reconcile these empirical facts.

In this paper, we propose a theory to solve to this puzzle. The two key features of our theory are that marriage requires a fixed entry cost and marriage may ease credit constraints to finance education. We motivate our theory by offering some archival evidence that wives during the 1950 and 1960s not only married young but also financially supported their husbands attending tertiary school.

We then calibrate this model and show that it can replicate the related stylized facts qualitatively and can explain a significant fraction of the evolution quantitatively. We then wrap up the paper with a discussion of some further empirical evidence that is in accordance with our model but would not be predicted by other models of marriage timing.

[31] As Bailey (2010) documents, accessing the birth control pill via early marriage had a marked impact on lower rates of fertility, which then precipitated increases in women's labor supply as well as their educational attainment.

While our model captures a number of prevalent features of the evolution of marriage and education in the twentieth century we established here, it fails to capture some others established by the earlier literature, as we discussed at the end of section IV. This is primarily driven by the fact that all individuals eventually marry in our model, and we maintain a constant and invariable return to women's education on the marriage markets throughout. Relaxing both of these assumptions as well as incorporating the role of endogenous divorce is left for future work.

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